

The RICIS Concept

Robert B. MacDonald

In May 1986, JSC initiated a cooperative program with the University of Houston - Clear Lake to support research in computing and information systems. The objective of this program was and is to provide continuing long-term research in support of the numerous mission and mission-related endeavors of NASA/JSC. JSC defined a "cooperative agreement" as the appropriate contractual vehicle to facilitate both joint participation of researchers from NASA, industry and the university community, and sharing of supporting research facilities among the participants. Facilities are shared by networking among UH-CL's research and data computing resources and JSC's computing system.

A significant part of the cooperative program is its "gateway role." UH-CL is chartered to involve researchers from outside organizations throughout the US and the world in projects defined by professionals at NASA and UH-CL.

A particularly important set of activities being carried out under the cooperative program is in the area of "computer software development." Because it recognized these activities as a critical element of the cooperative program, the Office Aeronautics and Space Technology at NASA Headquarters supported the initiation of the Software Engineering Research Center (SERC).

In order to meet research and education needs associated with the engineering of large, real-time software systems for NASA's future numerous researchers at SERC are investigating:

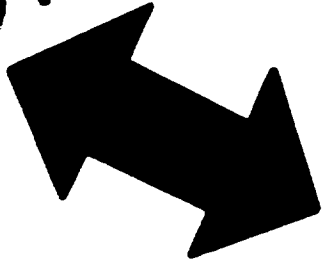
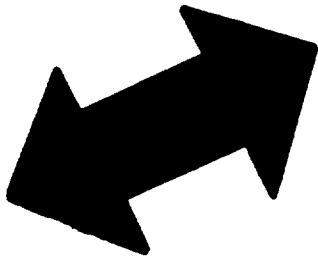
1. engineering research issues central to large distributed systems for real-time and distributed systems with active embedded elements (such as for the space station)
2. concepts, principles and methodologies for the engineering of such large software systems
3. "computer aided software engineering environments" to advance the state of the practice to achieve improvements in the quality productivity crucial to the application of engineering methodologies to software lifecycle phases
4. the establishment and incorporation into of future systems of appropriate standards.

With the growth of software development activities, comes the increase need for education. Currently most managers and professionals continue to emphasize the implementation and test phases of the "software lifecycle." More disciplined engineering approaches require that this managerial and professional workforce be educated in approaches to software development which emphasize requirement and design phases and designing for change.

The evolution of engineering methodologies and tools such as CASE and languages like ADA over the last ten years has created a severe shortage of individuals who are technically and emotionally prepared to exploit these advances. In response, the School of Education and the School of Natural and Applied Sciences at UH-Clear Lake have established the Software Engineering Professional Education Center (SEPEC). The objective of this new center is to interact with SERC and other organizations throughout the US, such as the SEI at Carnegie Mellon University, to develop and bring about suitable education and training at both professional and academic levels.

In short, the central goal of the SERC and SEPEC is to develop and make available the Engineering Knowhow, the qualified human resources and supporting tools and rules to better "engineer large, distributed, real-time software systems of the future."

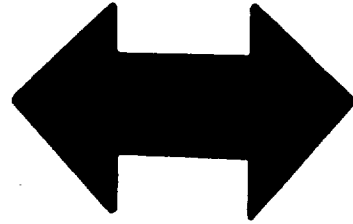
1981 / 1982



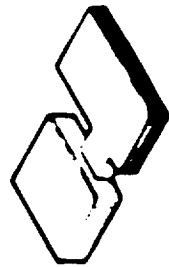
RESEARCH INSTITUTE

for

**COMPUTING and INFORMATION
SYSTEMS**



COMMUNITY



RICIS SYMPOSIUM '87

October 14, 1987

THE RICIS CONCEPT

by

E. T. DICKERSON

Dean, School of Natural & Applied Sciences, UH-Clear Lake

ROBERT B. MACDONALD

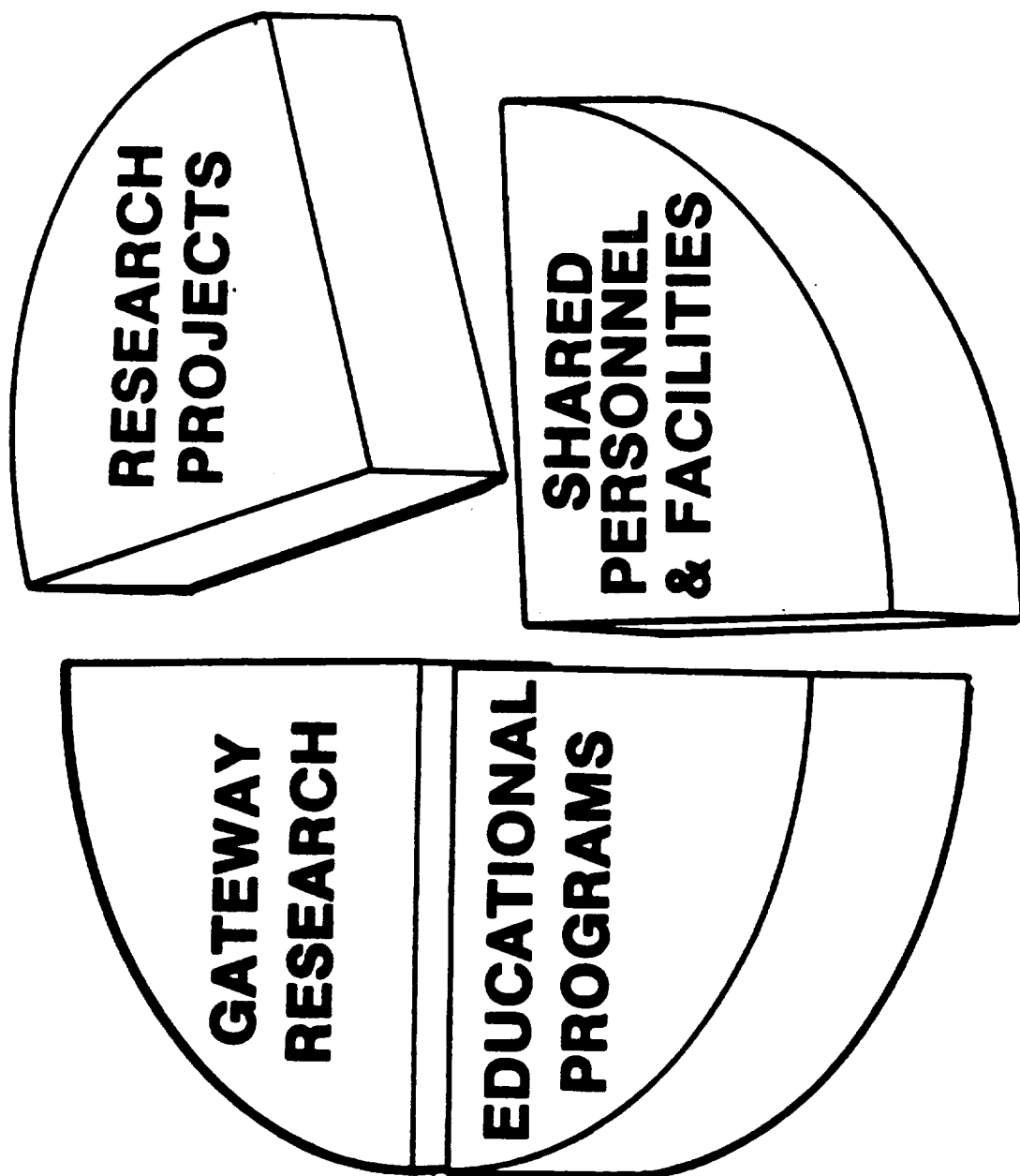
Mission Support Directorate, NASA Johnson Space Center

A. GLEN HOUSTON

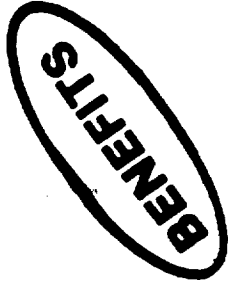
Director, RICIS, UH-Clear Lake

ACTIVITIES

for COMPUTING and INFORMATION SYSTEMS

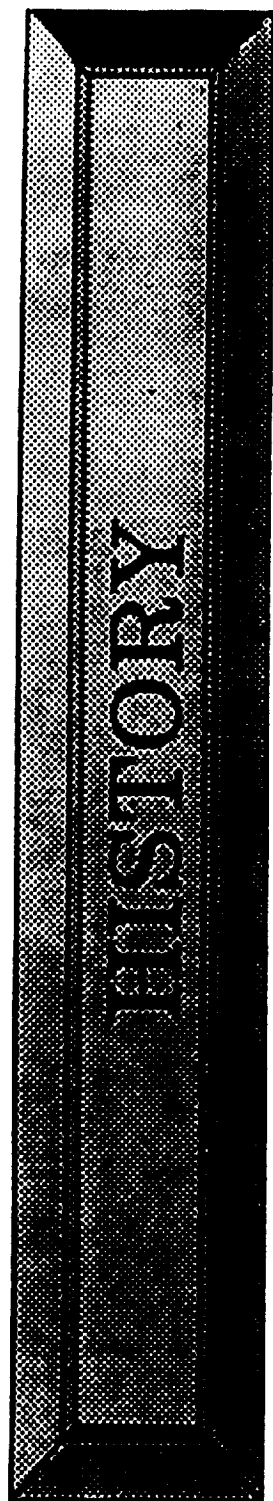


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RESEARCH INSTITUTE for COMPUTING and INFORMATION SYSTEMS

- **FOCUS FOR RESEARCH**
- **EVALUATION OF NEW TECHNOLOGIES**
- **INVESTIGATION OF STANDARDS**
- **DISSEMINATION OF INFORMATION**
- **COORDINATION OF EFFORT**
- **COST-EFFECTIVE USE OF FACILITIES**



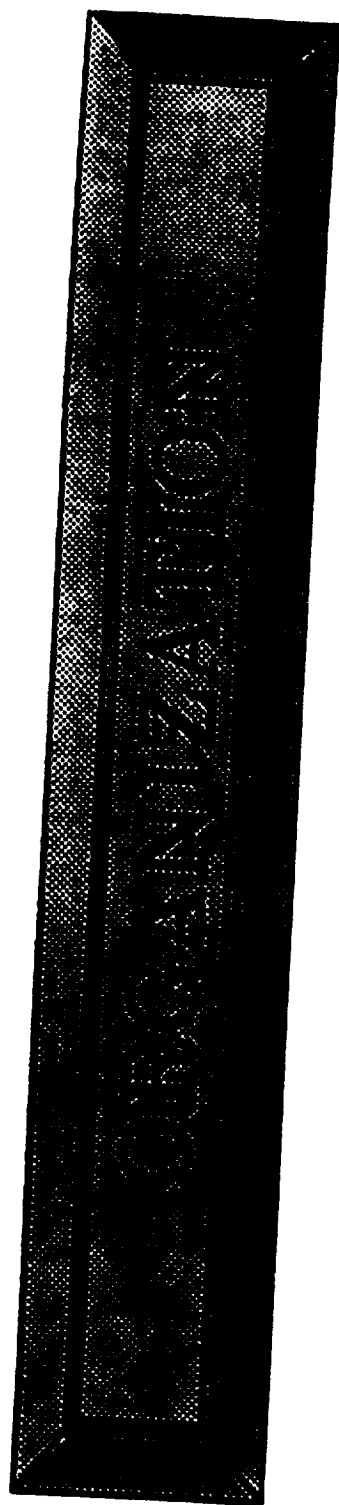
EVENTS LEADING TO RICIS

- TASK FORCE ESTABLISHED SUMMER 1983
(HARDWICK - COHEN)
- MEMORANDUM OF UNDERSTANDING - NOVEMBER 1983
(GRIFFIN - STAUFFER)
- TASK FORCE ESTABLISHED FOUR AREAS OF POSSIBLE
COOPERATION
 - COMPUTERS
 - HUMAN PERFORMANCE
 - EDUCATION AND TRAINING
 - R&D MANAGEMENT

EVENTS LEADING TO RICIS

(CONT)

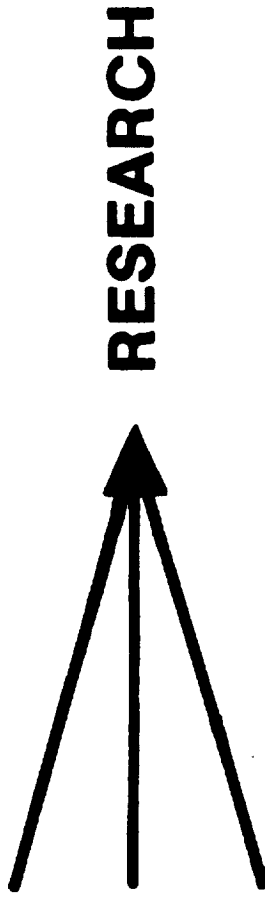
- RICIS CONCEPT ESTABLISHED BY UHCL-SST
- NASA - UHCL - SST
- RICIS CONCEPT SCOPE EXPANDED (1984)
- DIRECTOR APPOINTED (DEC 1985)
- UHCL STEERING COMMITTEE ESTABLISHED (JAN 1986)
- PROPOSAL TEAM APPOINTED (JAN 1986)
- UNSOLICITED PROPOSAL SUBMITTED TO NASA/JSC (MAR 1986)



MISSION

RESEARCH INSTITUTE for COMPUTING and INFORMATION SYSTEMS

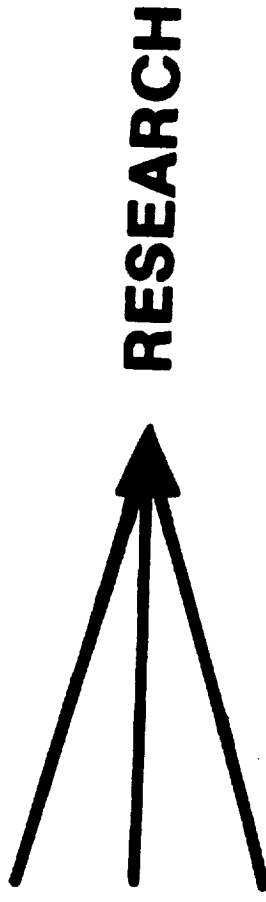
- **CONDUCT**
- **COORDINATE**
- **DISSEMINATE**

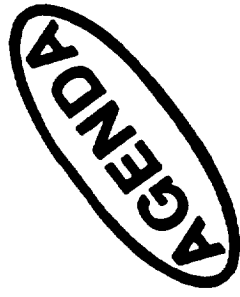


MISSION

RESEARCH INSTITUTE for COMPUTING and INFORMATION SYSTEMS

- **CONDUCT**
- **COORDINATE**
- **DISSEMINATE**

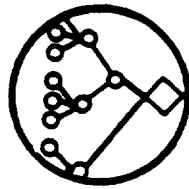




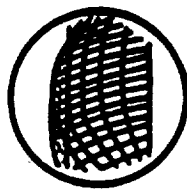
RESEARCH INSTITUTE for COMPUTING and INFORMATION SYSTEMS



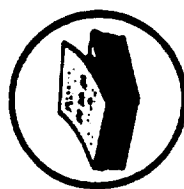
- **COMPUTER SYSTEMS AND SOFTWARE ENGINEERING**



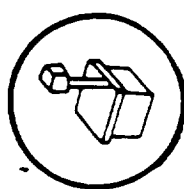
- **ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**



- **MATHEMATICAL AND STATISTICAL ANALYSIS**



- **INFORMATION MANAGEMENT**



- **EDUCATION AND TRAINING**

INTEGRATION STRATEGY

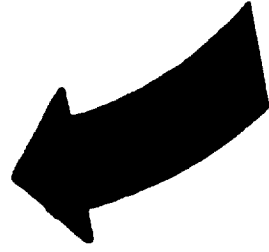
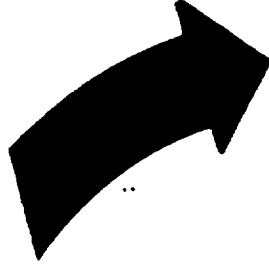
ESTABLISH STATE
OF RESEARCH

SUGGEST
NEW
ACTIONS

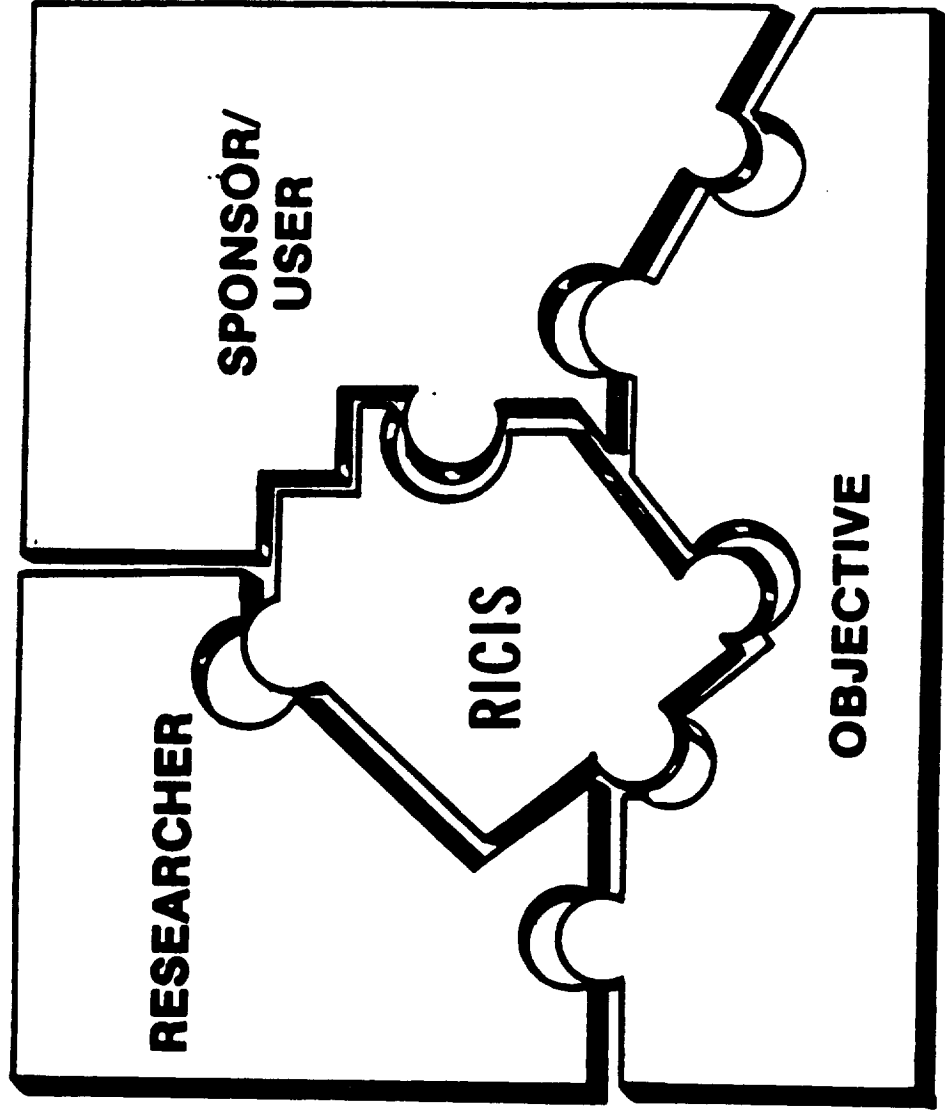
RICIS

RECRUIT
PRINCIPALS
AND SPONSORS

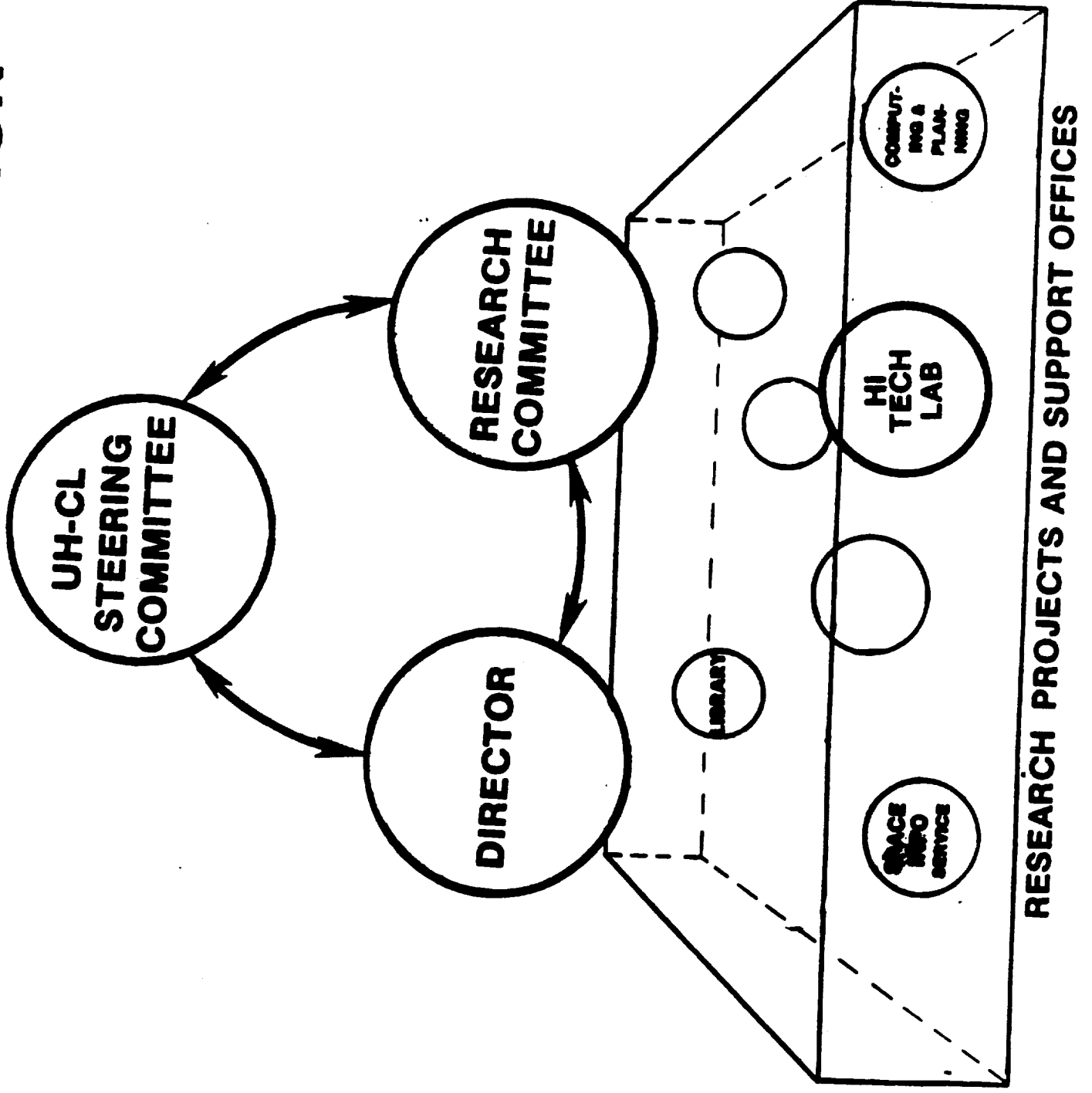
INTEGRATE
TECHNICAL
PRODUCTS



RESEARCH PROJECT "3-WAY MATCH"



UNIVERSITY ORGANIZATION



UH-CL STEERING COMMITTEE

RESPONSIBILITIES

- **ESTABLISH POLICY-LEVEL DIRECTION**
- **PROVIDE OVERALL MANAGEMENT AUTHORITY**
- **OVERSEE FISCAL AFFAIRS**
- **DIRECT STRATEGIC PLANNING**
- **SELECT PRINCIPAL INVESTIGATOR FROM ITS MEMBERSHIP**

DIRECTOR

RESPONSIBILITIES

- **SUPPORT STEERING COMMITTEE**
- **COORDINATE TACTICAL PLANNING WITH JSC**
- **PROVIDE STAFF SUPPORT TO RESEARCH COMMITTEE**
- **ASSIST IN ESTABLISHING RESEARCH PROJECTS**
- **MONITOR PROGRESS OF RESEARCH PROJECTS**
- **MANAGE INSTITUTE OFFICE**

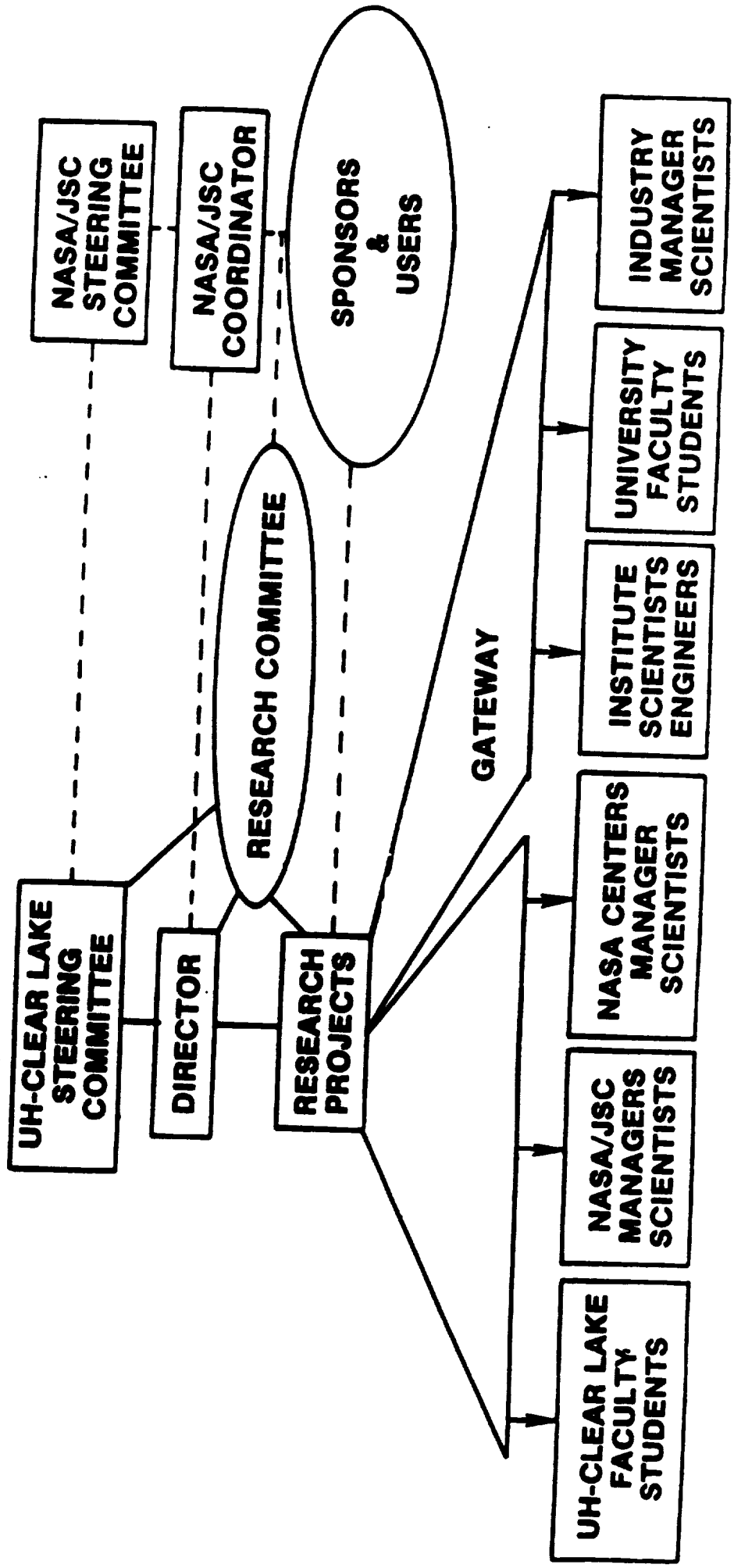
RESEARCH COMMITTEE

RESPONSIBILITIES

- **PROVIDE TECHNICAL DIRECTION**
- **ESTABLISH STATE OF RESEARCH**
- **PROMOTE RESEARCH ACTIVITIES**
- **IDENTIFY RESEARCH ORGANIZATIONS/PRINCIPALS**
- **INTEGRATE RESEARCH PROPOSALS AND REPORTS**
- **RECOMMEND NEW RESEARCH INITIATIVES**

RESEARCH INSTITUTE for COMPUTING and INFORMATION SYSTEMS

MANAGEMENT STRUCTURE



RESEARCH STATUS

RESEARCH ACTIVITY METHODOLOGY

- **RESEARCH ACTIVITY MAY BE INITIATED BY RESEARCHER OR JSC SPONSOR**
- **RESEARCH ACTIVITY DESCRIPTION (RAD) INCLUDES:**
 - **RESEARCH OBJECTIVE**
 - **BACKGROUND**
 - **APPROACH**
 - **SCHEDULE**
 - **DELIVERABLES**
 - **BUDGET**
- **RAD REQUIRES TECHNICAL APPROVAL (JSC AND UHCL)**
- **GATEWAY RESEARCH REQUIRES PROPOSAL (RAD) FROM RESEARCH ORGANIZATION**

RESEARCH ACTIVITY METHODOLOGY

(CONT)

- **EACH RESEARCH ACTIVITY IS INITIATED (OR LATER MODIFIED) VIA A PROGRAM CHANGE REQUEST (PCR)**
- **PCR REQUIRES ADMINISTRATIVE APPROVAL (JSC & UH-CLEAR LAKE)**

Table 1. Approved Research Activities as of September 30, 1987

RESEARCH INSTITUTE FOR COMPUTING & INFORMATION SYSTEMS
COOPERATIVE AGREEMENT NCC 9 - 16

Current Date: 11-Oct-87

RESEARCH ACTIVITY	PROJECT DIRECTOR	IMPLEMENTING ORGANIZATION	JSC TECHNICAL NAME	MONITOR ORG.	PERIOD	
					FROM	TO
AI.1 COMMUNICATION & TRACKING EXPERT SYSTEMS STUDY	LEIBFRIED	UH-CLEAR LAKE	SCHMIDT	EE7	6/1/87	12/31/87
AI.2 COMPUTER GRAPHICS TESTBED TO SIMULATE & TEST VISION SYSTEMS FOR SPACE APPLICATIONS	FEAGIN & CHEATHAM	RICE UNIVERSITY	CLEGHORN	FM7	6/1/87	10/15/87
AI.3 ROBOTIC PATH PLANNING & SOFTWARE TEST-BED ARCHITECTURE	FEAGIN & VOLZ	UNIV. OF MICHIGAN	CLEGHORN	FM7	6/1/87	12/31/87
AI.4 APPLICATION OF FUZZY SET AND RELATED THEORY TO FAILURE DETECTION AND CONTROL IN SPACE SYSTEMS	FEAGIN & SHERIDAN	M.I.T.	CLEGHORN	FM7	6/1/87	12/31/87
AI.5 DEMONSTRATION OF A 3D VISION ALGORITHM FOR SPACE APPLICATIONS	FEAGIN & deFIGUEIREDO	RICE UNIVERSITY	CLEGHORN	FM7	6/1/87	9/30/87
AI.6 SIMULATION OF ROBOTIC SPACE OPERATIONS	GIARRATANO & JANI	LINCOM	CLEGHORN	FM7	6/1/87	9/15/87
AI.7 T IN THE CRAY X/MP	FEAGIN & MUDAK	YALE UNIVERSITY	SAVELY	FM72	6/1/87	5/31/88
AI.8 R&D FOR ONBOARD NAVIGATION (ONAV) GROUND BASED EXPERT/TRAINER SYSTEM	FEAGIN & JANI	LINCOM CORP.	SAVELY	FM72	10/1/87	5/31/88
AI.9 OBJECT ORIENTED PROGRAMMING & FRAME REPRESENTATION USING ADA	FEAGIN, AUTY & CHARNIAK	SOFTech & BROWN UNIV.	SHULER	FR4	10/1/87	5/31/88
ET.1 SOFTWARE ENG. & ADA TNG	FREEDMAN	UH-CLEAR LAKE	GORMAN	FR43	1/16/87	5/31/87
ET.2 SOFTWARE ENGINEERING WITH ADA: A LIFE-CYCLE CURRICULUM	FREEDMAN	UH-CLEAR LAKE	GORMAN	FR43	6/1/87	12/31/87
ET.3 COMPUTER BASED ADA TRAINING SYSTEMS (CBATS)	FREEDMAN	UH-CLEAR LAKE	GORMAN	FR43	6/1/87	12/15/87
ET.4 SOFTWARE ENGINEERING AND ADA TRANSITION COURSE DEVELOPMENT	FREEDMAN & McBRIDE	UH-CLEAR LAKE & SOFTECH	KENNEDY	AK311	7/1/87	4/15/88
IM.1 SPACE MARKET MODEL	BISHOP	UH-CLEAR LAKE	DEMEL	KE	6/1/86	5/31/88
IM.2 CLEAR LAKE AREA COMPUTER CAPABILITY SURVEY	HODGIN	UH-CL BUREAU OF BUS. RESEARCH	MacDONALD	FA	2/1/87	6/30/87
IM.3 SPACE SHUTTLE PAYLOAD INFORMATION SYSTEM	BISHOP	UH-CLEAR LAKE	DEMING	EX2	1/1/87	12/31/87
IM.4 ELECTRONIC DOCUMENTATION	DEDE	UH-CLEAR LAKE	GORMAN	FR43	6/1/87	5/31/88
IM.5 LONG-RANGE PLAN FOR THE COMMERCIAL DEVELOPMENT OF THE SPACE STATION	BISHOP & EVAN	CTR FOR SPACE AND ADV. TECH.	SVEGLIATO HENDERSON	KE EX4	6/1/87	9/31/88
IM.6 METHODOLOGIES FOR INTEGRATED INFORMATION MANAGEMENT SYSTEMS	BISHOP & MAYER	TEXAS A&M	SAVELY	FM72	6/1/87	12/31/87
IM.7 DEVELOPING INTEGRATED PARAMETRIC PLANNING MODELS FOR BUDGETING AND MANAGING COMPLEX DEV. PROJ.	ETNYRE & BLACK	UH-CLEAR LAKE	WHITTINGTON	IX2	7/1/87	1/15/88
IM.8 CLEAR LAKE AREA COMPUTER CAPABILITY CENSUS	HODGIN	UH-CLEAR LAKE	MacDONALD	FA	8/1/87	3/1/88
IM.9 MANAGEMENT INFORMATION AND DECISION SUPPORT ENVIRONMENT	BISHOP	UH-CLEAR CLEAR	ERICKSON	FM26	8/1/87	5/31/88

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COOPERATIVE AGREEMENT MCC 9 - 16

Current Date: 11-Oct-87

	RESEARCH ACTIVITY	PROJECT DIRECTOR	IMPLEMENTING ORGANIZATION	JSC TECHNICAL NAME	MONITOR ORG.	PERIOD	
						FROM	TO
IM.10	RESEARCH IN IMAGE MANAGEMENT AND ACCESS	BISHOP & RORVIG	UNIV. OF TEXAS	PENROD	JA	10/1/87	5/31/88
MS.1	SPACE STATION MOMENTUM MANAGEMENT AND ATTITUDE CONTROL	FEAGIN & WIE	UNIV. OF TEXAS	BORDANO	FM4	6/1/87	1/31/88
PO.1	RICIS PROJECT OFFICE	HOUSTON	UH-CLEAR LAKE	MacDONALD	FA	6/1/86	5/31/88
SE.1	ADA PROGRAMMING SUPPORT ENVIRONMENT DATA BASE	LEKKOS & LIAM	UH-CLEAR LAKE	LOVEALL	FR121	6/1/86	1/15/88
SE.2	DMS TEST BED USER'S MANUAL DEVELOPMENT	McKAY & AUTY	SOFTECH, INC.	RAINES	EH421	6/1/86	10/31/86
SE.3	ADA-BASED S-O-A EXPERT SYSTEM BUILDER	McKAY & WILLIAMS	INFERENCE, INC.	SAVELY	FM72	9/1/86	6/30/87
SE.4	APSE BETA TEST SITE TEAM SUPPORT	McKAY & LEGRAND	SOFTECH, INC.	GORMAN	FR43	6/1/87	10/30/87
SE.5	BENCHMARKING OF ADA ON EMBEDDED COMPUTER SYS.	McKAY & AUTY	SOFTECH, INC.	HUMPHREY	EH431	7/1/86	5/31/87
SE.6	DEVELOPMENT OF A PROOF-OF-CONCEPT PROTOTYPE	McKAY & RANDALL	UH CLEAR LAKE & GHG INC.	GORMAN	FR43	6/1/86	12/31/87
SE.7	JOINT NASA/JSC UH-CL SERC	McKAY	UH-CLEAR LAKE	GORMAN	FR43	6/1/86	9/30/87
SE.8	WORK STATION EVALUATION	PERKINS & GRAVES	UH-CLEAR LAKE & BARRIOS	SCHWARTZ	EA121	6/1/86	10/31/87
SE.9	TESTING AND VERIFICATION OF ADA FLIGHT SOFTWARE FOR EMBEDDED COMPUTERS	McKAY & AUTY	SOFTECH, INC.	HUMPHREY	EH431	6/1/87	1/31/88
SE.10	ATOP : SERC - A STUDY OF CONVERTING PCTE SYSTEM SPECIFICATION TO ADA	McKAY, AUTY & ROGERS	SOFTECH, INC. & ROCKWELL	GORMAN	FR43	6/1/87	7/31/87
SE.11	SYMBOLIC INFORMATION IN ADA TESTING AND INTEGRATION	McKAY & AUTY	SOFTECH, INC.	GORMAN	FR43	6/1/87	2/15/88
SE.12	ATOP : SERC-SECURITY FOR SPACE SYSTEMS	McKAY & LeGRAND	SOFTECH, INC.	GORMAN	FR43	6/1/87	9/14/87
SE.13	ATOP : AUTOMATIC SOFTWARE VERIFICATION TOOLS	McKAY, COHEN & AUTY	SOFTECH, INC.	GORMAN	FR43	6/1/87	1/1/88
SE.14	IRDS PROTOTYPING W/ APPLICATION TO REPRESENTATION OF EA/RA MODELS	LEKKOS	UH-CLEAR LAKE	GORMAN	FR43	6/1/87	8/31/87
SE.15	FAULT TOLERANT ADA SOFTWARE	BOWN/DAVARI/ROGERS/McKAY	UH-CLEAR LAKE	GORMAN	FR43	6/1/87	12/31/87
SE.16	IMPLEMENT THE DISTRIBUTED ADA MODEL	McKAY, KAMRAD & RANDALL	HONEYWELL & GHG CORPORATION	GORMAN	FR43	6/1/87	5/31/88
SE.17	ADA ANALYSIS FOR NASA SPACE STATION PROGRAM OFFICE	McKAY & McBRIDE	SOFTECH, INC.	HALL	HQTS	6/1/87	5/31/88
SE.18	ESTABLISHMENT OF ADA TECHNOLOGY TRANSFER NETWORK: AdaNET	McKAY, BUTCHER & DIGMAN	MountainNET	BIVENS	HQTS	10/1/87	5/31/88

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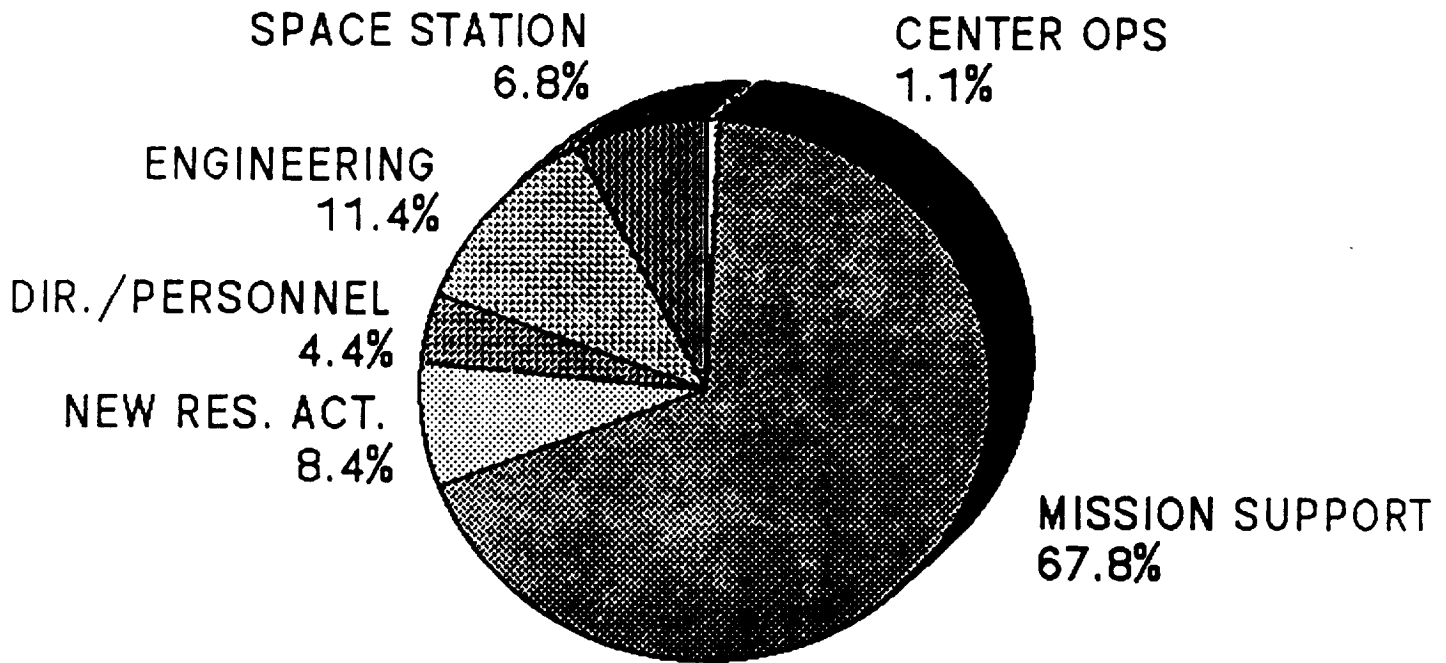
UH-CLEAR LAKE / NASA-JSC COOPERATIVE AGREEMENT NCC 9-16

THREE YEAR AGREEMENT BEGINNING JUNE 1, 1986

- ➔ EACH 12 MONTH SEGMENT FUNDED SEPARATELY**
- ➔ \$5.1M ALLOCATED FOR FIRST TWO YEARS**
- ➔ EXPENDED \$1.8M IN YEAR ONE**
- ➔ LEAVES \$3.3M FOR RESEARCH IN YEAR TWO**

RICIS JSC SPONSORS

JUNE 1, 1986 - SEPTEMBER 30, 1987

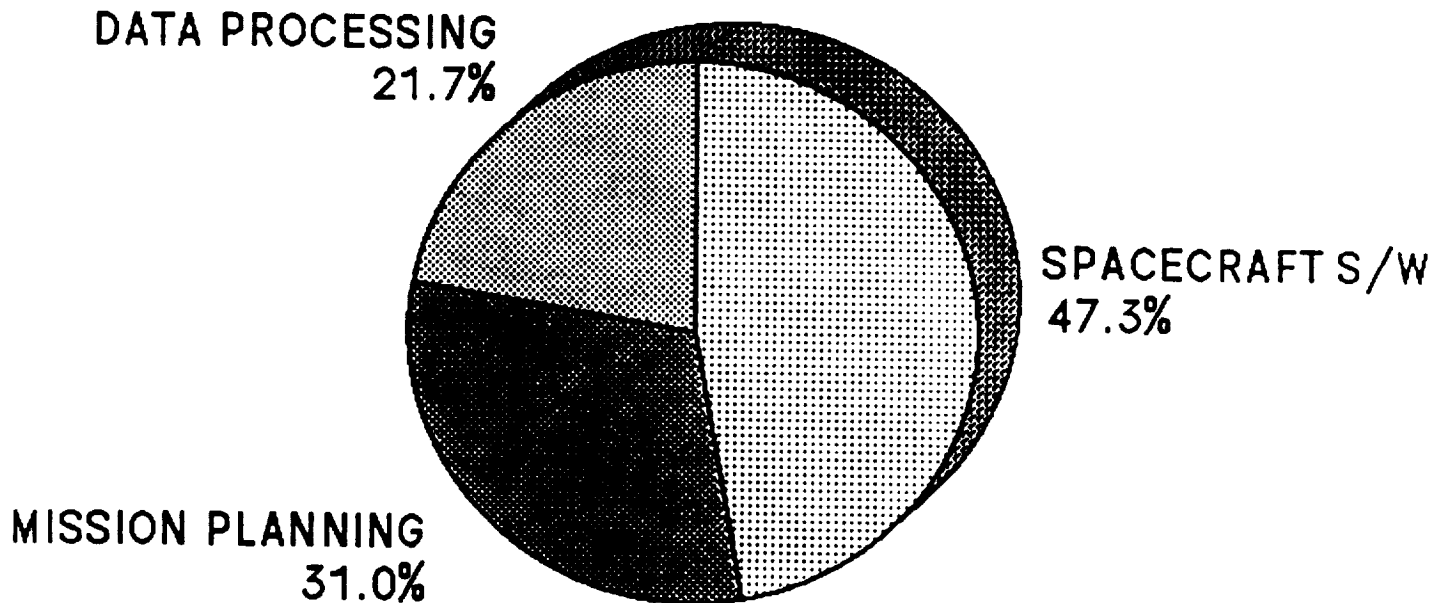


FUNDS ALLOCATED TOTAL \$5,059,942

RICIS JSC SPONSORS

MISSION SUPPORT DIRECTORATE

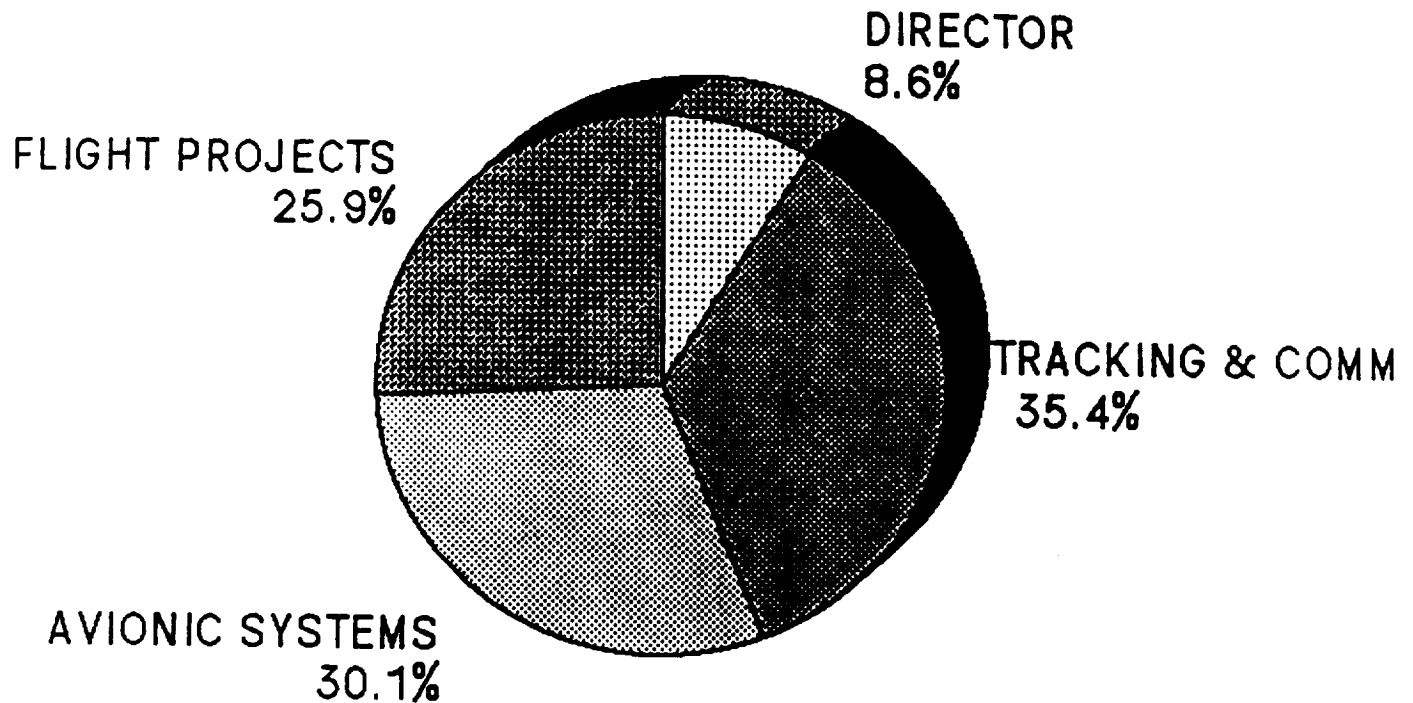
(Includes funds from the Navy and the Air Force)



FUNDS ALLOCATED TOTAL \$3,432,834

RICIS JSC SPONSORS

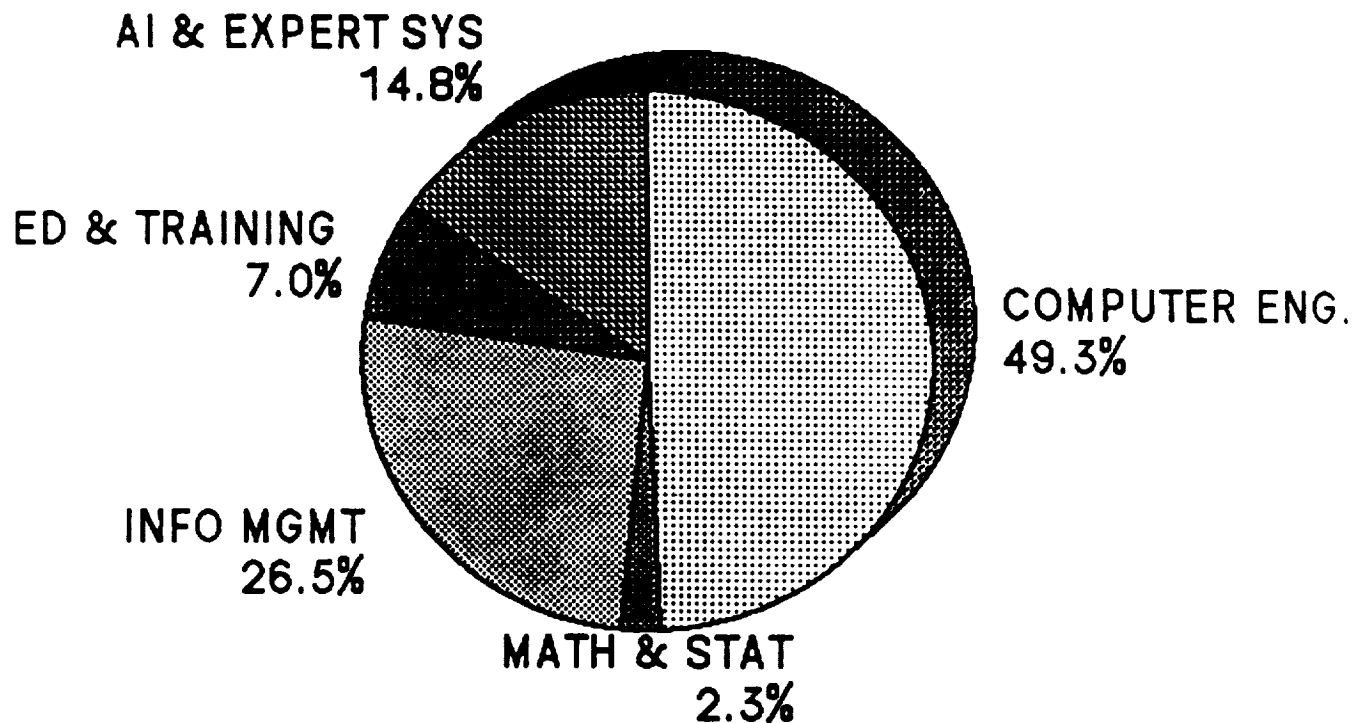
ENGINEERING DIRECTORATE



FUNDS ALLOCATED TOTAL \$578,733

RICIS RESEARCH

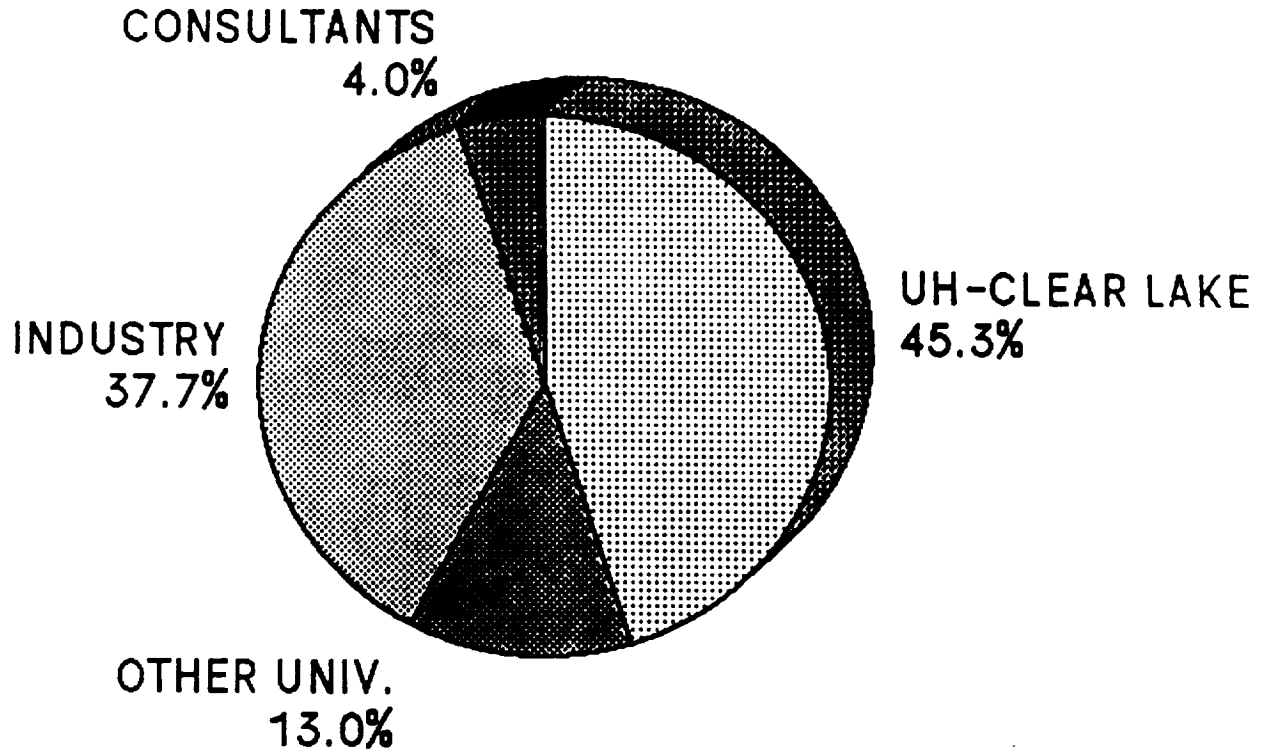
JUNE 1, 1986 - SEPTEMBER 30, 1987



APPROVED EXPENDITURES TOTAL \$4,462,742

RICIS RESEARCHERS

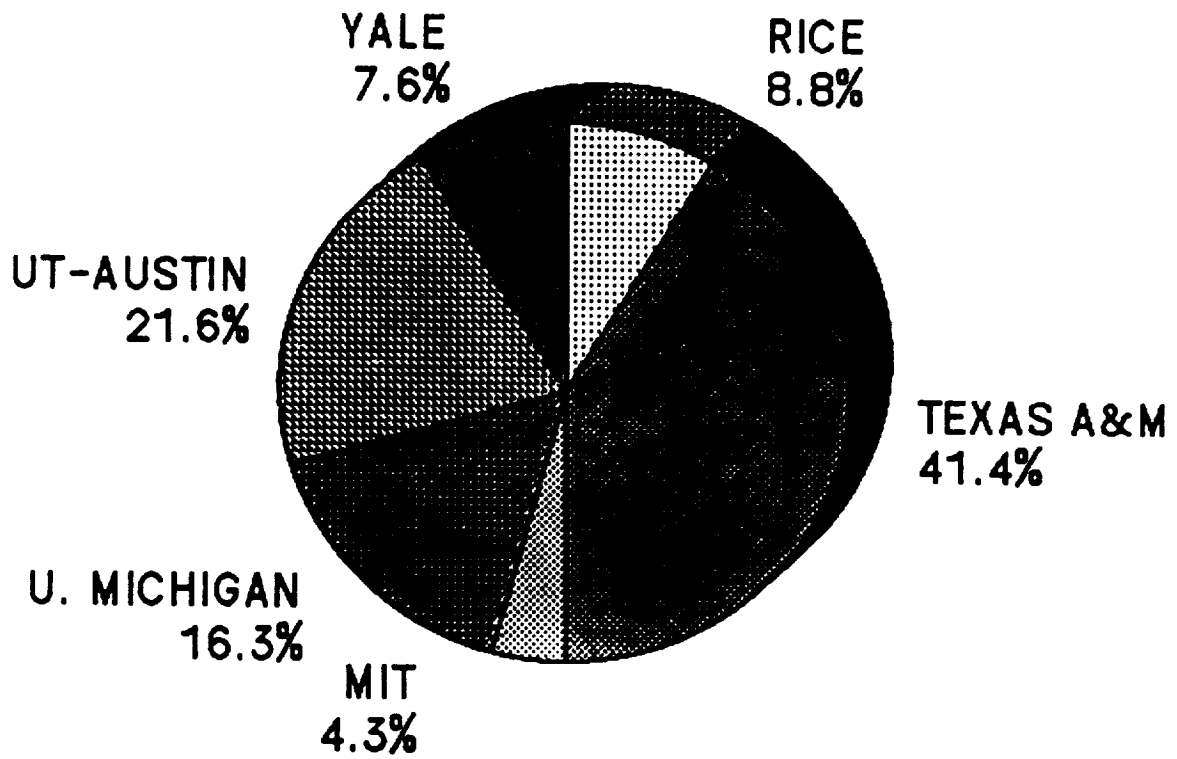
JUNE 1, 1986 - SEPTEMBER 30, 1987



APPROVED EXPENDITURES TOTAL \$4,462,742

RICIS RESEARCHERS

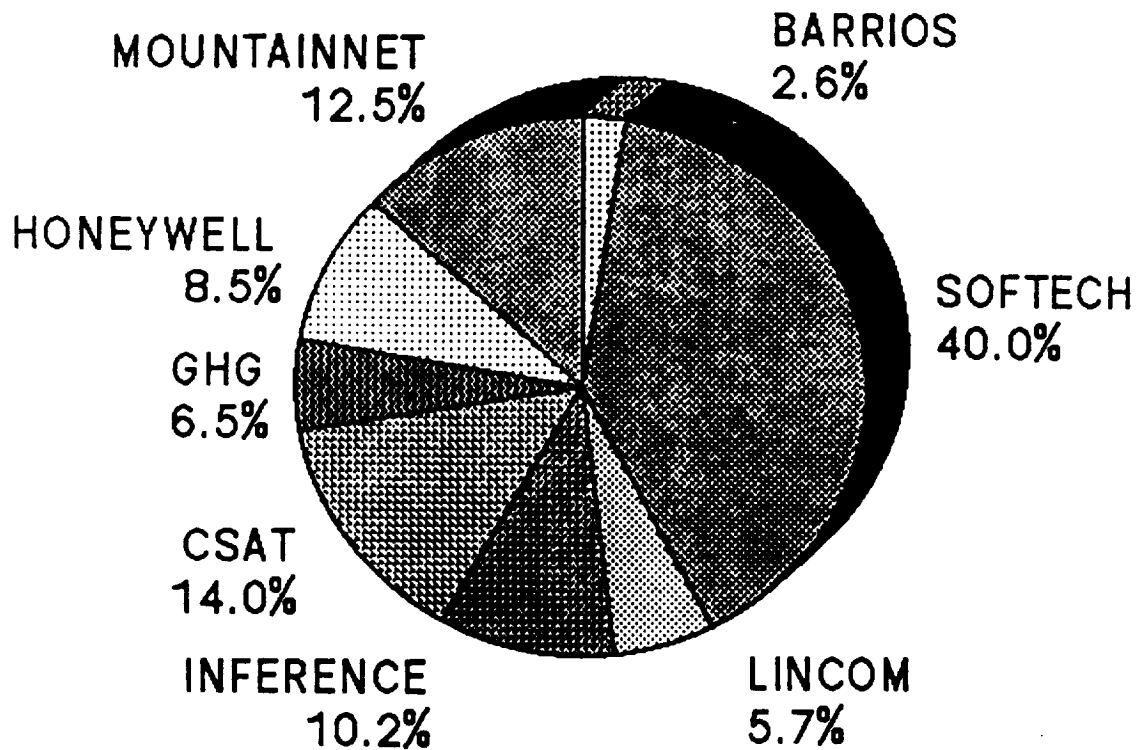
OTHER UNIVERSITIES



OTHER UNIV. EXPENDITURES TOTAL \$ 581,808

RICIS RESEARCHERS

INDUSTRY



INDUSTRY EXPENDITURES TOTAL \$1,680,901

JSC/UH-CL NETWORKING

RICIS COMPUTING RESOURCES

RCDF*
-SEQUENT
-HARRIS HCX-9

-IBM 4381

UNIVERSITY COMPUTING

-VAX 11/750

-VAX 11/780 Academic

-VAX 11/785

-VAX 8250

-VAX 8700 Administrative

LAN

-IBM Token Ring

-4 8228 MAU's

-11 IBM PC/AT

currently connected

ISCACCESS

To:

CIS-B (Profs)

CIS-C (Oracle/SEAD)

CIS-D (NOMAD/Shuttle Payload)
(Text DBMS/ ?)

via the 3274 controller and dial-in

* Research Computing and Data Facility

JSC/UH-CL NETWORKING

Plans

